

Protecting Your Property from Earthquakes

Bolt Sill Plates to Foundation

Are You At Risk?

If you aren't sure whether your house is at risk from earthquakes, check with your local building official, city engineer, or planning and zoning administrator. They can tell you whether you are in an earthquake hazard area. Also, they usually can tell you how to protect yourself and your house and property from earthquakes.

What You Can Do

Earthquake protection can involve a variety of changes to your house and property -- changes that can vary in complexity and cost. You may be able to make some types of changes yourself. But complicated or large-scale changes and those that affect the structure of your house or its electrical wiring and plumbing should be carried out only by a professional contractor licensed to work in your state, county, or city. One example of earthquake protection is bolting the sill plates of your house to its foundation to increase structural stability. This is something that only a licensed contractor should do.

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As shown in the figure, the sill plate of a house rests directly on top of the foundation. (This figure shows the sill plate for a house built on a cripple wall and crawl space foundation, a type of construction that is especially susceptible to earthquake damage.) If the sill plate is not securely anchored, an earthquake can cause it to shift on the foundation. When this occurs, there is a greater potential for severe damage as well as injury to you and members of your family.

One way to increase the stability of your house and reduce earthquake damage is to have the sill plate bolted or otherwise anchored to the foundation. In the method shown in the figure, bolts long enough to pass through the sill plate and penetrate several inches into the foundation are installed every few feet along the base of the exterior walls. This method is not limited to cripple wall construction; it can also be used for a house built on a basement or slab-on-grade foundation or on another type of crawl space foundation.

Tips

Keep these points in mind when you have the sill plates bolted to the foundation:

- Modifications to the foundation of your house must be done by a licensed contractor, who will ensure that the work is done correctly and according to all applicable codes. This is important for your safety.
- Bolts are usually installed no more than 6 feet apart. The work involved is likely to be extensive and may require that portions of the walls or floor be cut away temporarily.
- Your contractor may be able to recommend an alternative anchoring method based on other approved fasteners or connectors that can be installed with fewer changes to your house and less work.
- If your house is built on cripple walls, you should consider bracing them after the sill plates are bolted. For more information, refer to the separate earthquake protection fact sheet titled *Brace Cripple Walls*.

Estimated Cost

Having a contractor bolt the sill plates to the foundation will cost you about \$50 to \$75 per bolt, depending on the type of foundation you have. For example, a house measuring 60 feet by 30 feet, will have a

perimeter of 180 feet and would therefore require a minimum of 30 bolts (if the bolts are placed no more than 6 feet apart). So the cost for that house would be about \$1,500 to \$2,250.

Other Sources of Information

Seismic Retrofit Training for Building Contractors and Building Inspectors: Participant Handbook, FEMA, 1995

Reducing the Risks of Nonstructural Earthquake Damage: A Practical Guide, FEMA-74, 1994

Protecting Your Home and Business from Nonstructural Earthquake Damage, FEMA, 1994

To obtain copies of these and other FEMA documents, call FEMA Publications at **1-800-480-2520**.

Information is also available on the World Wide Web at <http://www.fema.gov>.

